

REMARKS

The Examiner has rejected claims 1-3, 6, 7, 9-11, 13-20, 26-28, 30-33, 35-40, and 92-96 are under 35 U.S.C. §103(a) as being unpatentable over Yao et al. U.S. Patent No. 6,051,114 (hereinafter “Yao”) in view of Yasar et al. U.S. Patent Application Publication No. 2003/0034244 (hereinafter “Yasar”).

Claims 12 and 29 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yao in view of Yasar, as applied to claims 1-3, 6, 7, 9-11, 13-20, 26-28, 30-33, 35-40, and 92-96 above, and further in view of Konishi et al. Japanese Patent No. 09-360040 (hereinafter “Konishi”).

Claim 34 is rejected under 35 U.S.C. §103(a) as being unpatentable over Yao in view of Yasar, as applied to claims 1-3, 6, 7, 9-11, 13-20, 26-28, 30-33, 35-40 and 92-96 above, and further in view of Gopalraja et al. U.S. Patent No. 6,274,008 (hereinafter “Gopalraja”).

Claims 43, 45-49, 53, 55, 57-59, 61, 62, 84 and 97 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yasar.

Claims 64, 67-70, 73, 74, 77-79, 81-83, and 85-89 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yasar, as applied to claims 43, 45-49, 53-55, 57-59, 61, 62, 84 and 97 above, and further in view of Yao.

Claims 60 and 80 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yasar in view of Yao, as applied to claims 43, 45-49, 53-55, 57-59, 61, 62, 64, 67-70, 73, 74, 77-79, 81-89 and 97 above, and further in view of Konishi.

Claim 63 is rejected under 35 U.S.C. §103(a) as being unpatentable over Yasar in view of Yao, as applied to claims 43, 45-49, 53-55, 57-59, 61, 62, 64, 67-70, 73, 74, 77-79, 81-89, and 97 above, and further in view of Gopalraja.

Claims 98-102 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yao in view of Yasar.

Claims 103-107 are rejected under 35 U.S.C. §103(a) as being unpatentable over Yasar in view of Yao.

The present invention relates to ionized physical vapor deposition (IPVD) and a process

useful for depositing ultra thin barrier layers and other layers onto the surfaces of sub-micron, high aspect ratio features on substrates by simultaneously depositing material and etching the deposited material by directing ions of the material onto the substrate for deposition while directing ions of gas onto the substrate for etching.

Yasar deals with sequential deposition and etching, and discusses how the process parameters are to be maintained differently during the deposition steps than during the etching steps. Yao essentially is the same. Yao however while discussing sequential deposition and etching at the top of column 6 (lines 3-27), briefly mentions that power parameters can be tailored to achieve sputtering of metal while simultaneously removing the metal layer formed on the field by bombardment with ions (lines 12-18), noting that buildup of metal on the field “is acceptable so long as the net deposition rate on the field is sufficiently small compared to the deposition rate in the trench” to prevent bridging of metal over the trench (lines 23-27).

So this portion of Yao contains the only suggestion* in the references that it would be nice to be able to simultaneously deposit and etch, perhaps by varying power parameters, but Yao does not otherwise explain how to do this. (*Note: The Konishi abstract mentions depositing while sputtering. But this is by plasma enhanced CVD where gas ions are used to accompany a CVD process to provide energy to control the composition or structure of the deposited film.)

Applicants are the first to teach how to deposit these films without overhangs by a useful simultaneous IPVD and etching process. Applicants teach specific ranges and parameter values that make the process work.

Applicants have amended independent claims 1, 43, 98 and 103 to more specifically focus on certain distinguishing aspects of the invention. New dependent claims 108-111 have been added to more fully claim a more complete process. It is submitted that nothing in the cited references teach that the specific details claimed by Applicants to successfully achieve a simultaneous IVPD and etch process that will deposit material without undesirable overhangs. The mere use of various parameters in the prior art for other processes tell nothing of what parameters are needed for the simultaneous dep/etch process of Applicants to be carried out

Application No. 10/811,326
Amendment dated April 13, 2009 in response to
Non-Final Office Action mailed January 13, 2009

successfully.

The previous amendment sets forth discussions of the different distinctive parameters and parameter combinations claimed by Applicants. The present amendments more specifically tie those parameter limitations into the claims and emphasize the importance of the parameters to the process steps.

The parameters disclosed in the references differ from those claimed or are disclosed as relevant to a process that differs from the simultaneous dep/etch processes claimed by Applicants. It is submitted that Applicants have claimed subject matter that is patentable over the cited references. This subject matter is set forth most particularly in claims 98-111, to which the Examiner's particular attention is directed.

In view of the foregoing amendments to the claims and remarks given herein, Applicants respectfully submit that this application is in condition for allowance and respectfully request allowance of the pending claims. If the Examiner believes any detailed language of the claims requires further discussion, the Examiner is respectfully asked to telephone the undersigned attorney so that the matter may be promptly resolved. The Examiner's prompt attention to this matter is appreciated.

Application No. 10/811,326
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Applicants are of the opinion that no fee is due with this Amendment. If any additional charges or credits are necessary to complete this communication, please apply them to Deposit Account No. 23-3000.

Respectfully submitted,

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